Part Numbering System

CL	10	C	101	J	B	8	N	N	N	C
1	2	3	4	5	6	7	8	9	10	11

1. SERIES CODE

CL=Multi layer Ceramic Capacitors

2. SIZE CODE — inch(㎜)

02=01005(0402)	21=0805(2012)	43=1812(4532)
03=0201(0603)	31=1206(3216)	55=2220(5750)
05=0402(1005)	32=1210(3225)	
10=0603(1608)	42=1808(4520)	

★

3. DIELECTRIC CODE

Class Ⅰ	Class Ⅱ
C=C0G	A=X5R F=Y5V B=X7R X=X6S Y=X7S

★★

4. CAPACITANCE CODE

Capacitance expressed in pF. 2 significant digits plus number of zeros.
example) 106=10×10^6=10000000pF
For Values < 10pF, Letter R denotes decimal point
example) 1R5=1.5pF

5. TOLERANCE CODE

A=±0.05pF	D=±0.5pF	J=±5%	Z=+80/-20%
B=±0.1pF	F=±1pF, ±1%*	K=±10%	
C=±0.25pF	G=±2%	M=±20%	

*For Values ≤ 10pF, F=±1pF
Values > 10pF, F=±1%

6. RATED VOLTAGE CODE

R=4V	O=16V	B=50V	E=250V	H=630V	K=3000V
Q=6.3V	A=25V	C=100V	F=350V	I=1000V	
P=10V	L=35V	D=200V	G=500V	J=2000V	

★★★

7. THICKNESS CODE

3=0.30㎜	A=0.65㎜	F=1.25㎜	L=3.20㎜	S=1.35㎜
5=0.50㎜	C=0.85㎜	H=1.60㎜	M=1.15㎜	U=1.80㎜
8=0.80㎜	D=1.00㎜	I=2.00㎜	P=1.15㎜	V=2.50㎜
9=0.90㎜	E=1.10㎜	J=2.50㎜	Q=1.25㎜	Y=1.25㎜

8. INNER ELECTRODE / TERMINATION / PLATING CODE

A= Normal Product Pd / Ag / Ni barrier / Sn 100%
N= Normal Product Ni / Cu / Ni barrier / Sn 100%
G= Normal Product Cu / Cu / Ni barrier / Sn 100%
L= Low profile Ni / Cu / Ni barrier / Sn 100%
S=Nomal Product Ni/Cu/Ag-Epoxy/Ni barrier /Sn100%

9. PRODUCT CODE

A= Array(2-element) L= LICC
B= Array(4-element) N= Normal

*Size tolerance

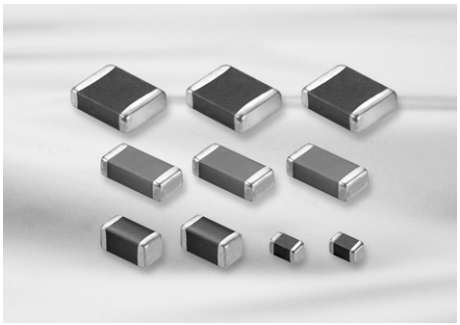
Code \ Size	0201(0603)	0402(1005)	0603(1608)	0805(2012)
S	±0.05	±0.07	±0.07	
Q	±0.07	±0.1	±0.15	±0.15
R	±0.1	±0.15	±0.2	±0.2
U	-	±0.2	-	-

10. SPECIAL CODE

N= special code

11. PACKAGING CODE

B= Bulk	O= Cardboard Tape, 10"Reel	E= Embossed Type, 7"Reel
P= Bulk Case	D= Cardboard Tape, 13"Reel(10,000ea)	F= Embossed Type, 13"Reel
C= Cardboard Tape, 7"Reel	L= Cardboard Tape, 13"Reel(15,000ea)	S= Embossed Type, 10"Reel



Feature

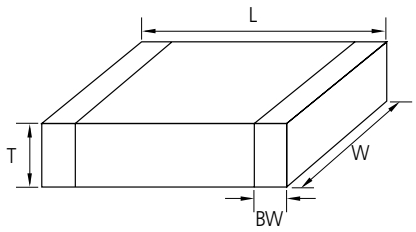
- Wide selection of size : from 0402 to 2220
- Highly reliable tolerance and high speed automatic chip placement on PCBs
- Wide capacitance range
- Wide temperature compensation and voltage range
  : from C0G to Y5V and from 6.3V to 50V
- Highly reliable performance
- Highly resistant termination metal
- Tape & reel for surface mount assembly

Application

- HHP, DSC, DVC, LCD, TV, Memory Module, PDA, Game Machine
- Tuner (Product code C is suitable.)

※ Medical, Aviation, Automobile device should be following a special specification.

Structure and Dimensions



Size Code	EIA Code	Dimension(mm)				
		L	W	T	Thickness Code	BW
05	0402	1.00±0.05	0.50±0.05	0.50±0.05	5	0.2+0.15/-0.1
10	0603	1.60±0.10	0.80±0.10	0.50+0.0/-0.1	5	0.30±0.20
				0.80±0.10	8	
21	0805	2.00±0.10	1.25±0.10	0.85±0.10	C	0.5+0.2/-0.3
				1.25±0.10	F	
		2.00±0.15	1.25±0.15	1.25±0.15	Q	
		2.00±0.20	1.25±0.20	1.25±0.20	Y	
31	1206	3.20±0.20	1.60±0.20	0.60±0.10	6	0.50±0.30
				0.85±0.15 0.85±0.10(*)	C	
				1.15±0.10	P	
		3.20±0.15	1.60±0.15	1.25±0.15	F	
		3.20±0.20	1.60±0.20	1.60±0.20	H	
32	1210	3.20±0.30	2.50±0.20	0.85±0.15 0.85±0.10(*)	C	0.60±0.30
				0.90±0.10	9	
				1.60±0.20	H	
				1.80±0.20	U	
				2.00±0.20	I	
				2.50±0.20	J	
		3.20±0.40	2.50±0.30	2.50±0.30	v	
42	1808	4.50±0.40	2.00±0.20	2.00±0.20	I	0.80±0.30
43	1812	4.50±0.40	3.20±0.30	3.20±0.30	L	0.80±0.30
55	2220	5.70±0.40	5.00±0.40	3.20±0.30	L	1.00±0.30

■ * Mark is only applicable to "L" code , 12th code in part number.

Class Ⅰ (Temperature Compensation)

Symbol	EIA Code	Operation Temperature Range(℃)	Temperature Coefficient Range(ppm/℃)
C	C0G	-55 ~ +125	0 ±30

★ Class Ⅱ (High Dielectric Constant)

Symbol	EIA Code	Operation Temperature Range(℃)	Capacitance Change(△C %)
A	X5R	-55 ~ + 85	±15
B	X7R	-55 ~ +125	±15
X	X6S	-55 ~ +105	±22
F	Y5V	-30 ~ + 85	-82 ~ +22
Y	X7S	-55 ~ +125	±22

★★

Series	TC	Capacitance Step											
E-3	Y5V	1.0				2.2				4.7			
E-6	X5R X7R X6S	1.0		1.5		2.2		3.3		4.7		6.8	
E-12	C0G	1.0	1.2	1.5	1.8	2.2	2.7	3.3	3.9	4.7	5.6	6.8	8.2

★★★

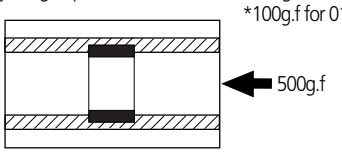
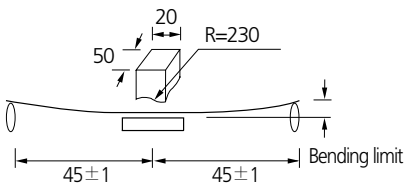
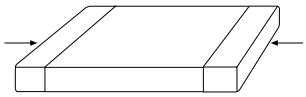
Size	Code	Thickness(mm)	Spec(mm)
01005(0402)	2	0.20	±0.02
0201(0603)	3	0.30	±0.03
0402(1005)	5	0.50	±0.05
0603(1608)	5	0.50	+0.0/-0.1
	8	0.80	±0.10
0805(2012)	A	0.65	±0.10
	C	0.85	±0.10
	D	1.00	±0.15
	F	1.25	±0.10
	Q	1.25	±0.15
	Y	1.25	±0.2
1206(3216)	C	0.85	±0.15 *±0.10
	D	1.00	±0.15
	E	1.10	±0.10
	P	1.15	±0.10
	F	1.25	±0.15
	H	1.60	±0.20
1210(3225)	C	0.85	±0.15 *±0.10
	9	0.90	±0.10
	M	1.15	±0.10
	F	1.25	±0.20
	S	1.35	±0.15
1210(3225)	H	1.60	±0.20
	U	1.80	±0.20
	I	2.00	±0.20
	J	2.50	±0.20
	V	2.50	±0.30
1808(4520)	F	1.25	±0.20
	H	1.60	±0.20
	I	2.00	±0.20
1812(4532)	F	1.25	±0.20
	H	1.60	±0.20
	I	2.00	±0.20
	J	2.50	±0.20
	L	3.20	±0.30
2220(5750)	F	1.25	±0.20
	H	1.60	±0.20
	I	2.00	±0.20
	J	2.50	±0.20
	L	3.20	±0.30

■ * Mark is only applicable to "L" code , 12th code in part number.
■ Please discuss with sales person with regard to Pd products.

Part Numbering System
General Capacitors
High Capacitance Capacitors
Super Small Size Capacitors
Medium-High Voltage Capacitors
Array Type Capacitors
Low ESL Capacitors
Reliability Test Condition
Premium Capacitors for Automotive Applications
Packaging Specification
Application Manual for Surface Mounting

Reliability Test Condition

<table>
<tr><th>No</th><th colspan="2">Item</th><th>Performance</th><th colspan="3">Test Condition</th></tr>
<tr><td>1</td><td colspan="2">Appearance</td><td>No abnormal exterior appearance</td><td colspan="3">Visual Inspection through Microscope(×10)</td></tr>
<tr><td>2</td><td colspan="2">Insulation Resistance</td><td>10,000MΩ min. or 500MΩ · μF min.(or *100MΩ · μF) product whichever is smaller
(Rated voltage ≤ 16V:10,000MΩ min. or 100MΩ · μF min. product whichever is smaller)</td><td colspan="3">Apply the rated voltage for 60~120 sec.
Rated voltage > 500V: Insulation Resistance shall be measured with 500±50Vdc</td></tr>
<tr><td>3</td><td colspan="2">Withstanding Voltage</td><td>No dielectric breakdown or mechanical breakdown</td><td colspan="3">Apply the specified voltage* for 1~5 sec.
Charge/Discharge current limit: 50mA max.
*CLASS Ⅰ (Rated Voltage < 100V): 300% of the rated Voltage
CLASS Ⅱ (Rated Voltage < 100V): 250% of the rated Voltage
In the case of Vr ≥ 100V products, following condition should be applied.
100V ≤ Rated Voltage < 500V: 200% of the rated Voltage
500V ≤ Rated Voltage < 1000V: 150% of the rated Voltage
Rated Voltage ≥ 1000V: 120% of the rated Voltage</td></tr>
<tr><td rowspan="6">4</td><td rowspan="6">Capacitance</td><td rowspan="3">CLASS Ⅰ</td><td rowspan="3">Within the specified tolerance</td><td>Capacitance</td><td>Frequency</td><td>Voltage</td></tr>
<tr><td>≤1,000pF</td><td>1MHz±10%</td><td rowspan="2">0.5 ~ 5 Vrms</td></tr>
<tr><td>>1,000pF</td><td>1KHz±10%</td></tr>
<tr><td rowspan="3">CLASS Ⅱ</td><td rowspan="3">Within the specified tolerance</td><td>Capacitance</td><td>Frequency</td><td>Voltage</td></tr>
<tr><td>≤10μF</td><td>1KHz±10%</td><td>1.0±0.2 Vrms</td></tr>
<tr><td>>10μF</td><td>120Hz±20%</td><td>0.5±0.1Vrms</td></tr>
<tr><td rowspan="6">5</td><td rowspan="2">Q</td><td rowspan="2">CLASS Ⅰ</td><td rowspan="2">Capacitance ≥ 30pF : Q ≥ 1,000
< 30pF : Q ≥ 400 +20×C
(C : Capacitance)</td><td>Capacitance</td><td>Frequency</td><td>Voltage</td></tr>
<tr><td>≤1,000pF</td><td>1MHz±10%</td><td rowspan="2">0.5 ~ 5 Vrms</td></tr>
<tr><td rowspan="5">Tanδ</td><td rowspan="5">CLASS Ⅱ</td><td rowspan="5">1. Characteristic: A(X5R)
<table><tr><th>Rated Voltage</th><th>Spec</th></tr><tr><td>50V / 35V</td><td>0.025 max / 0.05 max*</td></tr><tr><td>25V</td><td>0.025 max /
0.05 max* / 0.10 max*</td></tr><tr><td>16V</td><td>0.035 max /
0.05 max* / 0.10 max*</td></tr><tr><td>≤10V</td><td>0.05 max /0.10 max*</td></tr></table>2. Characteristic: B(X7R), X(X6S), Y(X7S)
<table><tr><th>Rated Voltage</th><th>Spec</th></tr><tr><td>50V≥ / 35V / 25V</td><td>0.025 max /
0.05 max* / 0.10 max*</td></tr><tr><td>16V</td><td>0.035 max / 0.10 max*</td></tr><tr><td>≤10V</td><td>0.05 max /0.10 max*</td></tr></table>3. Characteristic: F(Y5V)
<table><tr><th>Rated Voltage</th><th>Spec</th></tr><tr><td>50V / 35V / 25V</td><td>0.05 max /
0.07 max* / 0.09 max*</td></tr><tr><td>16V</td><td>0.07 max /
0.09 max* / 0.125 max*</td></tr><tr><td>10V</td><td>0.125 max /0.16 max*</td></tr><tr><td>≤6.3V</td><td>0.16 max</td></tr></table></td><td>Capacitance</td><td>Frequency</td><td>Voltage</td></tr>
<tr><td>≤10μF</td><td>1KHz±10%</td><td>1.0±0.2 Vrms</td></tr>
<tr><td>>10μF</td><td>120Hz±20%</td><td>0.5±0.1Vrms</td></tr>
<tr><td>*</td><td>1KHz±10%</td><td>0.5±0.1Vrms</td></tr>
<tr><td colspan="3"></td><td colspan="3">You can check the specification at the web site or contact sales people for each product with mark*</td></tr>
</table>

<table>
<tr><th>No</th><th colspan="2">Item</th><th colspan="3">Performance</th><th>Test Condition</th></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Temperature Characteristics of Capacitance</td><td>CLASS Ⅰ</td><td colspan="3"><table><tr><td>Characteristic</td><td>Temp.Coefficient(PPM/℃)</td></tr><tr><td>C</td><td>0 ± 30</td></tr></table></td><td rowspan="2">Capacitance shall be measured by the steps shown in the following table.<table><tr><td>Step</td><td>Temperature(℃)</td></tr><tr><td>1</td><td>25 ± 2</td></tr><tr><td>2</td><td>Min. Operating Temp. ±2</td></tr><tr><td>3</td><td>25 ± 2</td></tr><tr><td>4</td><td>Max. Operating Temp. ±2</td></tr><tr><td>5</td><td>25 ± 2</td></tr></table>(1) CLASS Ⅰ
Temperature Coefficient shall be calculated from the formula as below
Temp. Coefficient= $\frac{C2-C1}{C1\times\triangle T}\times10^6$[ppm/℃]
C1: Capacitance at step 3
C2: Capacitance at 125℃
△T: 100℃(=125℃-25℃)
(2) CLASS Ⅱ
Capacitance Change shall be calculated from the formula as below
$\triangle C=\frac{C2-C1}{C1}\times100(\%)$
C1: Capacitance at step 3
C2: Capacitance at step 2 or 4</td></tr>
<tr><td>CLASS Ⅱ</td><td colspan="3"><table><tr><td>Characteristic</td><td>Capacitance Change(%) with No bias</td></tr><tr><td>A(X5R) / B(X7R)</td><td>±15%</td></tr><tr><td>X(X6S), Y(X7S)</td><td>±22%</td></tr><tr><td>F(Y5V)</td><td>+22%~-82%</td></tr></table></td></tr>
<tr><td>7</td><td colspan="2">Adhesive Strength of Termination</td><td colspan="3">No indication of peeling shall occur on the terminal electrode</td><td>Apply 500g.f* pressure for 10±1 sec. *200g.f for 0201
*100g.f for 01005
  </td></tr>
<tr><td rowspan="3">8</td><td rowspan="3">Bending Strength</td><td>Appearance</td><td colspan="3">No indication of peeling shall occur</td><td rowspan="3">• Bending Limit: 1mm • Test Speed: 1.0mm/sec.
• Keep the test board at the limit point in 5 sec.
• Then Measure Capacitance
  </td></tr>
<tr><td rowspan="2">Capacitance</td><td>Characteristic</td><td colspan="2">Capacitance Change</td></tr>
<tr><td>CLASS Ⅰ</td><td colspan="2">±5% or ± 0.5 pF whichever is larger</td></tr>
<tr><td>CLASS Ⅱ</td><td>A(X5R), B(X7R), X(X6S), Y(X7S)</td><td>±12.5%</td></tr>
<tr><td></td><td></td><td>F(Y5V)</td><td>±30%</td></tr>
<tr><td>9</td><td colspan="2">Solderability</td><td colspan="3">More than 75% of the terminal surface is to be soldered newly, so metal part does not come out or dissolve
  </td><td><table><tr><td>Solder</td><td>Sn-3Ag-0.5Cu</td></tr><tr><td>Solder Temp.</td><td>245±5℃</td></tr><tr><td>Flux</td><td>RMA Type</td></tr><tr><td>Dip time</td><td>3±0.3 sec.</td></tr><tr><td>Pre-heating</td><td>at 80~120℃ for 10~30 sec.</td></tr></table></td></tr>
<tr><td rowspan="7">10</td><td rowspan="7">Resistance to Soldering Heat</td><td>Appearance</td><td colspan="3">No mechanical damage shall occur</td><td rowspan="7">Solder temperature: 270±5℃ DIP TIME:10±1 sec.
Each termination shall be fully immersed and preheated as below:<table><tr><td>Step</td><td>Temperature(℃)</td><td>Time (sec.)</td></tr><tr><td>1</td><td>80~100</td><td>60</td></tr><tr><td>2</td><td>150~180</td><td>60</td></tr></table>
Leave the capacitor in ambient condition for specified time* before measurement
*24 ± 2 hours(CLASS Ⅰ)
24 ± 2 hours(CLASSⅡ)</td></tr>
<tr><td rowspan="3">Capacitance</td><td>Characteristic</td><td colspan="2">Capacitance Change</td></tr>
<tr><td>CLASS Ⅰ</td><td colspan="2">±2.5% or ± 0.25 pF whichever is larger</td></tr>
<tr><td>CLASS Ⅱ</td><td>A(X5R), B(X7R)
X(X6S), Y(X7S)</td><td>±7.5%</td></tr>
<tr><td></td><td>F(Y5V)</td><td>±20%</td></tr>
<tr><td>Q (CLASS Ⅰ)</td><td colspan="3">Within the specified initial value</td></tr>
<tr><td>Tanδ (CLASSⅡ)</td><td colspan="3">Within the specified initial value</td></tr>
<tr><td>Insulation resistance</td><td colspan="3">Within the specified initial value</td></tr>
<tr><td>Withstanding voltage</td><td colspan="3">Within the specified initial value</td></tr>
</table>

Part Numbering System
General Capacitors
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Packaging Specification
Application Manual for Surface Mounting

No	Item		Performance			Test Condition
11	Vibration Test	Appearance	No mechanical damage shall occur			The capacitor shall be subjected to a harmonic motion having a total amplitude of 1.5mm changing frequency from 10Hz to 55Hz and back to 10Hz in about 1 min. Repeat this for 2hours each in 3 mutually perpendicular directions.
		Capacitance	Characteristic		Capacitance Change	
			CLASS Ⅰ		±2.5% or ± 0.25 pF whichever is larger	
			CLASS Ⅱ	A(X5R), B(X7R)	±5%	
				X(X6S), Y(X7S)	±10%	
				F(Y5V)	±20%	
		Q (CLASS Ⅰ)	Within the specified initial value			
		Tanδ (CLASSⅡ)	Within the specified initial value			
		Insulation resistance	Within the specified initial value			
12	Moisture Resistance	Appearance	No mechanical damage shall occur			Applied Voltage: rated voltage Temperature: 40±2℃ Humidity: 90~95% RH Duration Time: 500+12/-0 Hr. Charge/Discharge Current: 50㎃ max. Perform the initial measurement according to Note1. Perform the final measurement according to Note2. This test is only applied to Vr≤500V products. You can check the specification at the web site or contact sales people for each product with mark*
		Capacitance	Characteristic		Capacitance Change	
			CLASS Ⅰ		±7.5% or ± 0.75pF whichever is larger	
			CLASS Ⅱ	A(X5R), B(X7R), X(X6S), Y(X7S)	±12.5%	
				F(Y5V)	±30%	
		Q (CLASS Ⅰ)	Capacitance≥30pF : Q≥200 <30pF : Q≥100+10/3×C(C: Capacitance)			
		Tanδ (CLASSⅡ)	1.Capacitance: A(X5R) 0.05 max / 0.075 max* (35V / 50V) 0.05 max / 0.075 max* / 0.125 max*(16V / 25V) 0.075 max / 0.125 max* (≤10V) 2.Capacitance: B(X7R), X(X6S) 0.05 max / 0.125 max* (16V / 25V / 35V / 50V≥) 0.075 max / 0.125 max* (≤10V) 3.Capacitance: F(Y5V) 0.09 max (50V) 0.09 max / 0.125 max* (25V / 35V) 0.09 max / 0.125 max* / 0.16 max* (16V) 0.16 max / 0.195 max* (10V) 0.195 max (4V / 6.3V)			
		Insulation resistance	500㏁ min. or 25㏁·㎌ min. product whichever is smaller / 12.5㏁·㎌ or over*			
13	High Temperature Resistance	Appearance	No mechanical damage shall occur			Temperature : max. operating temperature Duration Time: 1000+48/-0 Hr. Charge/Discharge Current: 50㎃ max. Vr≤200V : 200% of the rated Voltage 250V≤Vr≤500V: 150% of the rated Voltage Vr=630V : 120% of the rated Voltage 1000V≤Vr≤3000V: 100% of the rated Voltage * : 150% or 100% of the rated Voltage Perform the initial measurement according to Note1 for class Ⅱ Perform the final measurement according to Note2. You can check the specification at the web site or contact sales people for each product with mark*
		Capacitance	Characteristic		Capacitance Change	
			CLASS Ⅰ		±3% or ± 0.3 pF whichever is larger	
			CLASS Ⅱ	A(X5R), B(X7R), X(X6S), Y(X7S)	±12.5%	
				F(Y5V)	±30%	
		Q (CLASS Ⅰ)	Capacitance≥30pF : Q≥350 10≤Capacitance<30pF : Q≥275+2.5×C Capacitance<10pF : Q≥200+10×C (C: Capacitance)			
		Tanδ (CLASSⅡ)	1.Capacitance: A(X5R) 0.05 max / 0.075 max* (35V / 50V) 0.05 max / 0.075 max* / 0.125 max*(16V / 25V) 0.075 max / 0.125 max* (≤10V) 2.Capacitance: B(X7R), X(X6S) 0.05 max / 0.125 max* (16V / 25V / 35V / 50V≥) 0.075 max / 0.125 max* (≤10V) 3.Capacitance: F(Y5V) 0.09 max (50V) 0.09 max / 0.125 max* (25V / 35V) 0.09 max / 0.125 max* / 0.16 max* (16V) 0.16 max / 0.195 max* (10V) 0.195 max (4V / 6.3V)			
		Insulation resistance	1,000㏁ min. or 50㏁·㎌ min. product whichever is smaller / 25㏁·㎌ or over*			

No	Item		Performance			Test Condition
11	Vibration Test	Appearance	No mechanical damage shall occur			The capacitor shall be subjected to a harmonic motion having a total amplitude of 1.5mm changing frequency from 10Hz to 55Hz and back to 10Hz in about 1 min. Repeat this for 2hours each in 3 mutually perpendicular directions.
		Capacitance	Characteristic		Capacitance Change	
			CLASS Ⅰ		±2.5% or ± 0.25 pF whichever is larger	
			CLASS Ⅱ	A(X5R), B(X7R)	±5%	
				X(X6S), Y(X7S)	±10%	
				F(Y5V)	±20%	
		Q (CLASS Ⅰ)	Within the specified initial value			
		Tanδ (CLASSⅡ)	Within the specified initial value			
		Insulation resistance	Within the specified initial value			
12	Moisture Resistance	Appearance	No mechanical damage shall occur			Applied Voltage: rated voltage Temperature: 40±2℃ Humidity: 90~95% RH Duration Time: 500+12/-0 Hr. Charge/Discharge Current: 50㎃ max. Perform the initial measurement according to Note1. Perform the final measurement according to Note2. This test is only applied to Vr≤500V products. You can check the specification at the web site or contact sales people for each product with mark*
		Capacitance	Characteristic		Capacitance Change	
			CLASS Ⅰ		±7.5% or ± 0.75pF whichever is larger	
			CLASS Ⅱ	A(X5R), B(X7R), X(X6S), Y(X7S)	±12.5%	
				F(Y5V)	±30%	
		Q (CLASS Ⅰ)	Capacitance≥30pF : Q≥200 <30pF : Q≥100+10/3×C(C: Capacitance)			
		Tanδ (CLASSⅡ)	1.Capacitance: A(X5R) 0.05 max / 0.075 max* (35V / 50V) 0.05 max / 0.075 max* / 0.125 max*(16V / 25V) 0.075 max / 0.125 max* (≤10V) 2.Capacitance: B(X7R), X(X6S) 0.05 max / 0.125 max* (16V / 25V / 35V / 50V≥) 0.075 max / 0.125 max* (≤10V) 3.Capacitance: F(Y5V) 0.09 max (50V) 0.09 max / 0.125 max* (25V / 35V) 0.09 max / 0.125 max* / 0.16 max* (16V) 0.16 max / 0.195 max* (10V) 0.195 max (4V / 6.3V)			
		Insulation resistance	500㏁ min. or 25㏁·㎌ min. product whichever is smaller / 12.5㏁·㎌ or over*			
13	High Temperature Resistance	Appearance	No mechanical damage shall occur			Temperature : max. operating temperature Duration Time: 1000+48/-0 Hr. Charge/Discharge Current: 50㎃ max. Vr≤200V : 200% of the rated Voltage 250V≤Vr≤500V: 150% of the rated Voltage Vr=630V : 120% of the rated Voltage 1000V≤Vr≤3000V: 100% of the rated Voltage * : 150% or 100% of the rated Voltage Perform the initial measurement according to Note1 for class Ⅱ Perform the final measurement according to Note2. You can check the specification at the web site or contact sales people for each product with mark*
		Capacitance	Characteristic		Capacitance Change	
			CLASS Ⅰ		±3% or ± 0.3 pF whichever is larger	
			CLASS Ⅱ	A(X5R), B(X7R), X(X6S), Y(X7S)	±12.5%	
				F(Y5V)	±30%	
		Q (CLASS Ⅰ)	Capacitance≥30pF : Q≥350 10≤Capacitance<30pF : Q≥275+2.5×C Capacitance<10pF : Q≥200+10×C (C: Capacitance)			
		Tanδ (CLASSⅡ)	1.Capacitance: A(X5R) 0.05 max / 0.075 max* (35V / 50V) 0.05 max / 0.075 max* / 0.125 max*(16V / 25V) 0.075 max / 0.125 max* (≤10V) 2.Capacitance: B(X7R), X(X6S) 0.05 max / 0.125 max* (16V / 25V / 35V / 50V≥) 0.075 max / 0.125 max* (≤10V) 3.Capacitance: F(Y5V) 0.09 max (50V) 0.09 max / 0.125 max* (25V / 35V) 0.09 max / 0.125 max* / 0.16 max* (16V) 0.16 max / 0.195 max* (10V) 0.195 max (4V / 6.3V)			
		Insulation resistance	1,000㏁ min. or 50㏁·㎌ min. product whichever is smaller / 25㏁·㎌ or over*			

<table>
<tr><th>No</th><th colspan="4">Item</th><th>Performance</th><th>Test Condition</th></tr>
<tr><td rowspan="8">14</td><td rowspan="8">Temperature Cycle</td><td>Appearance</td><td colspan="3">No mechanical damage shall occur</td><td rowspan="8">Capacitor shall be subjected to 5 cycles.
Condition for 1 cycle:
<table><tr><th>Step</th><th>Temperature(℃)</th><th>Time(min.)</th></tr><tr><td>1</td><td>min. operating temperature +0/-3</td><td>30</td></tr><tr><td>2</td><td>25</td><td>2~3</td></tr><tr><td>3</td><td>max. operating temperature +0/-3</td><td>30</td></tr><tr><td>4</td><td>25</td><td>2~3</td></tr></table>Leave the capacitor in ambient condition for specified time* before measurenment
*24 ± 2 hours(CLASS Ⅰ)
24 ± 2 hours(CLASSⅡ)</td></tr>
<tr><td rowspan="5">Capacitance</td><td colspan="2">Characteristic</td><td>Capacitance Change</td></tr>
<tr><td colspan="2">CLASS Ⅰ</td><td>±2.5% or ± 0.25pF whichever is larger</td></tr>
<tr><td rowspan="3">CLASSⅡ</td><td>A(X5R), B(X7R)</td><td>±7.5%</td></tr>
<tr><td>X(X6S), Y(X7S)</td><td>±15%</td></tr>
<tr><td>F(Y5V)</td><td>±20%</td></tr>
<tr><td>Q (CLASS Ⅰ)</td><td colspan="3">Within the specified initial value</td></tr>
<tr><td>Tanδ (CLASSⅡ)</td><td colspan="3">Within the specified initial value</td></tr>
<tr><td>Insulation resistance</td><td colspan="3">Within the specified initial value</td></tr>
</table>

<table>
<tr><th>No</th><th colspan="6">Recommended Soldering Method</th></tr>
<tr><td rowspan="20">15</td><td rowspan="20">Recommended Soldering Method By Size & Capacitance</td><td rowspan="2">Size inch(mm)</td><td rowspan="2">Temperature Characteristic</td><td rowspan="2">Capacitance</td><td colspan="2">Condition</td></tr>
<tr><td>Flow</td><td>Reflow</td></tr>
<tr><td>01005(0402)</td><td rowspan="3">-</td><td rowspan="3">-</td><td rowspan="3">-</td><td rowspan="3">○</td></tr>
<tr><td>0201 (0603)</td></tr>
<tr><td>0402 (1005)</td></tr>
<tr><td rowspan="3">0603(1608)</td><td>Class Ⅰ</td><td>-</td><td>○</td><td>○</td></tr>
<tr><td rowspan="2">Class Ⅱ</td><td>C < 1㎌</td><td>○</td><td>○</td></tr>
<tr><td>C ≥ 1㎌</td><td>-</td><td>○</td></tr>
<tr><td rowspan="3">0805 (2012)</td><td>Class Ⅰ</td><td>-</td><td>○</td><td>○</td></tr>
<tr><td rowspan="2">Class Ⅱ</td><td>C < 4.7㎌</td><td>○</td><td>○</td></tr>
<tr><td>C ≥ 4.7㎌</td><td>-</td><td>○</td></tr>
<tr><td>Array</td><td>-</td><td>-</td><td>○</td></tr>
<tr><td rowspan="3">1206 (3216)</td><td>Class Ⅰ</td><td>-</td><td>○</td><td>○</td></tr>
<tr><td rowspan="2">Class Ⅱ</td><td>C < 10㎌</td><td>○</td><td>○</td></tr>
<tr><td>C ≥ 10㎌</td><td>-</td><td>○</td></tr>
<tr><td>Array</td><td>-</td><td>-</td><td>○</td></tr>
<tr><td>1210 (3225)</td><td rowspan="4">-</td><td rowspan="4">-</td><td rowspan="4">-</td><td>○</td></tr>
<tr><td>1808 (4520)</td><td>○</td></tr>
<tr><td>1812 (4532)</td><td>○</td></tr>
<tr><td>2220 (5750)</td><td>○</td></tr>
</table>

Note1. Initial Measurement For Class Ⅱ

Perform the heat treatment at 150℃+0/-10℃ for 1 hour. Then Leave the capacitor in ambient condition for 24±2 hours before measurement. Then perform the measurement.

Note2. Latter Measurement

1. CLASS Ⅰ
   Leave the capacitor in ambient condition for 24±2 hours before measurement. Then perform the measurement.
2. CLASSⅡ
   Perform the heat treatment at 150℃+0/-10℃for 1 hour. Then Leave the capacitor in ambient condition for 24±2 hours before measurement. Then perform the measurement.

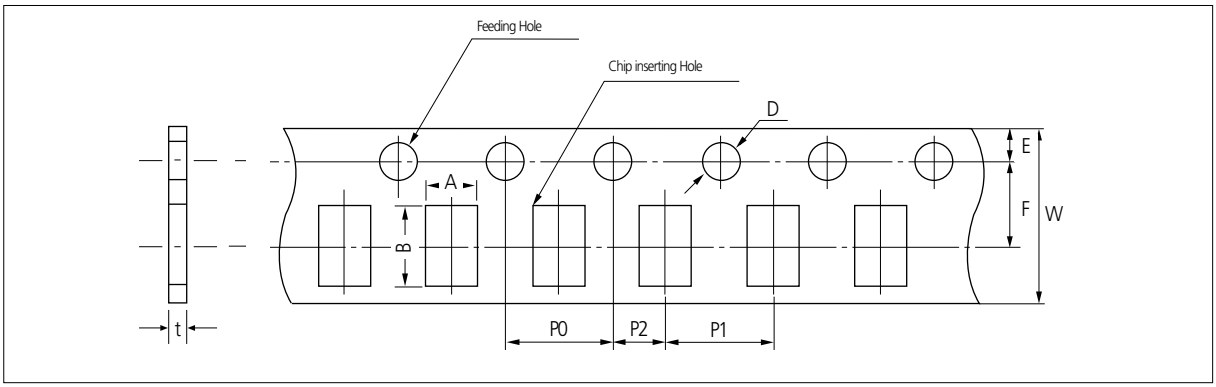
Note3. All Size in Reliability Test Condition Section is "inch"

Note4. Camera Strobe Circuit Capacitors Should be Following a Special Reliability Test Condition.
Please check with our sales representatives or product engineers.

Part Numbering System
General Capacitors
High Capacitance Capacitors
Super Small Size Capacitors
Medium-High Voltage Capacitors
Array Type Capacitors
Low ESL Capacitors
Reliability Test Condition
Premium Capacitors for Automotive Applications
Packaging Specification
Application Manual for Surface Mounting

Packaging Specifications

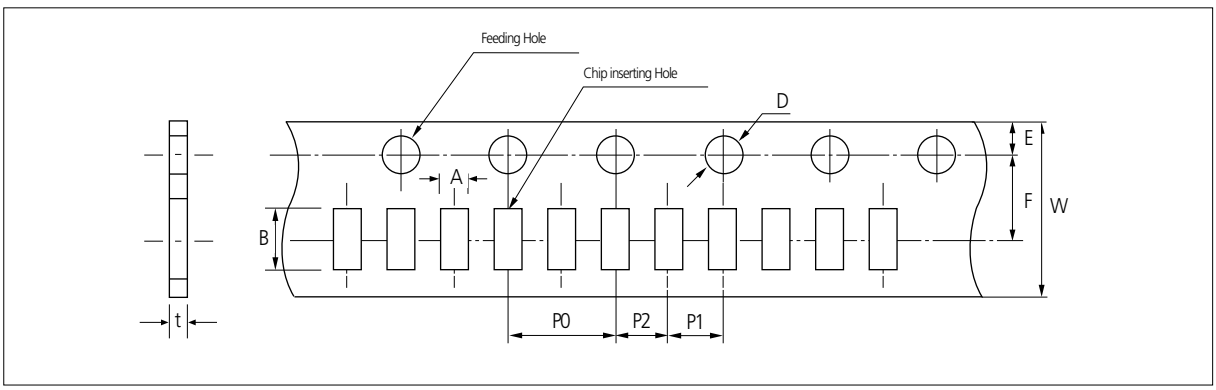
Cardboard Paper Tape(4mm)



Unit: inch(mm)

Symbol / Type		A	B	W	F	E	P1	P2	P0	D	t
Dimension	0504 (1410)	1.3 ±0.2	1.7 ±0.2	8.0 ±0.3	3.5 ±0.05	1.75 ±0.1	4.0 ±0.1	2.0 ±0.05	4.0 ±0.1	Ø1.5 +0.1/-0	1.1 Below
	0603 0306 (1608) (0816)	1.1 ±0.2	1.9 ±0.2								
	0805 0508 (2012) (1220)	1.6 ±0.2	2.4 ±0.2								
	1206 0612 (3216) (1632)	2.0 ±0.2	3.6 ±0.2								

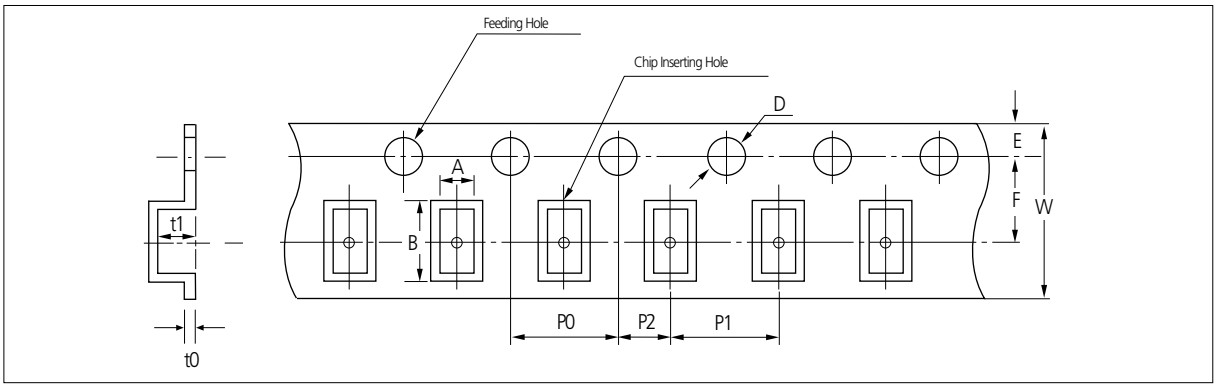
Cardboard Paper Tape(2mm)



Unit: inch(mm)

Symbol / Type		A	B	W	F	E	P1	P2	P0	D	t
Dimension	01005 (0402)	0.24 ±0.02	0.44 ±0.02	8.0 ±0.3	3.5 ±0.05	1.75 ±0.1	2.0 ±0.05	2.0 ±0.05	4.0 ±0.1	Ø1.5 +0.1/-0.03	0.23 ±0.02
	0402 (1005)	0.26 ±0.03	0.46 ±0.03								0.26 ±0.03
	0201 (0603)	0.38 ±0.03	0.68 ±0.03								0.37 ±0.03
	0402 (1005)	0.62 ±0.04	1.12 ±0.04								0.6 ±0.05
											0.37 ±0.05

Embossed Plastic Tape

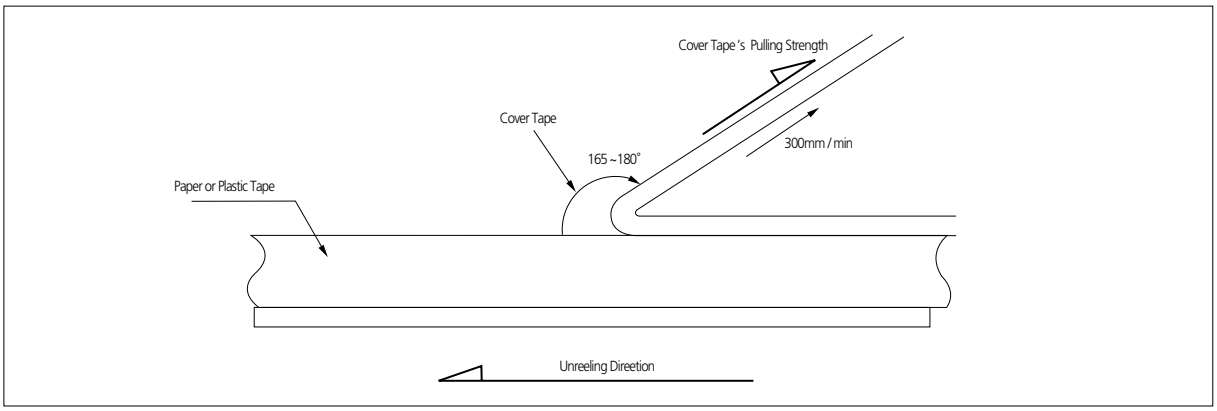


Unit: inch(mm)

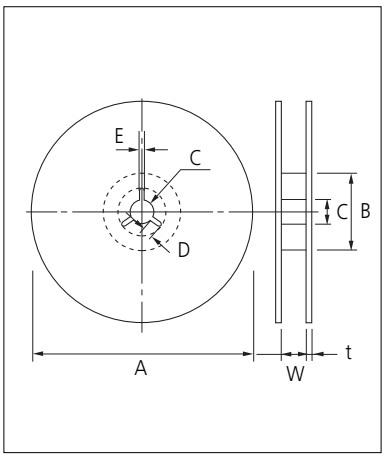
Symbol / Type		A	B	W	F	E	P1	P2	P0	D	t1	t0
Dimension	01005 (0402)	0.25 ±0.02	0.45 ±0.02	4.0 ±0.05	1.8 ±0.02	0.9 ±0.05	1.0 ±0.02	1.0 ±0.02	2.0 ±0.04	Ø0.8 ±0.04	0.24 ±0.02	max 0.5
	0603 (1608)	1.05 ±0.15	1.9 ±0.15	8.0 ±0.3	3.5 ±0.05	1.75 ±0.1	4.0 ±0.1	2.0 ±0.05	4.0 ±0.1	Ø1.5 +0.1/ - 0	2.8 max	0.6 BELOW
	0805 (2012)	1.45 ±0.2	2.3 ±0.2									
	1206 0612 (3216) (1632)	1.9 ±0.2	3.5 ±0.2									
	1210 (3225)	2.8 ±0.2	3.6 ±0.2									
	1808 (4520)	2.3 ±0.2	4.9 ±0.2	12.0 ±0.3	5.60 ±0.05		8.0 ±0.1				3.8 max	
	1812 (4532)	3.6 ±0.2	4.9 ±0.2									
	2220 (5750)	5.5 ±0.2	6.2 ±0.2									

Peeling off of Cover Tape

• 5 g.f ≤ Peel off force ≤ 70 g.f



Reel Dimensions



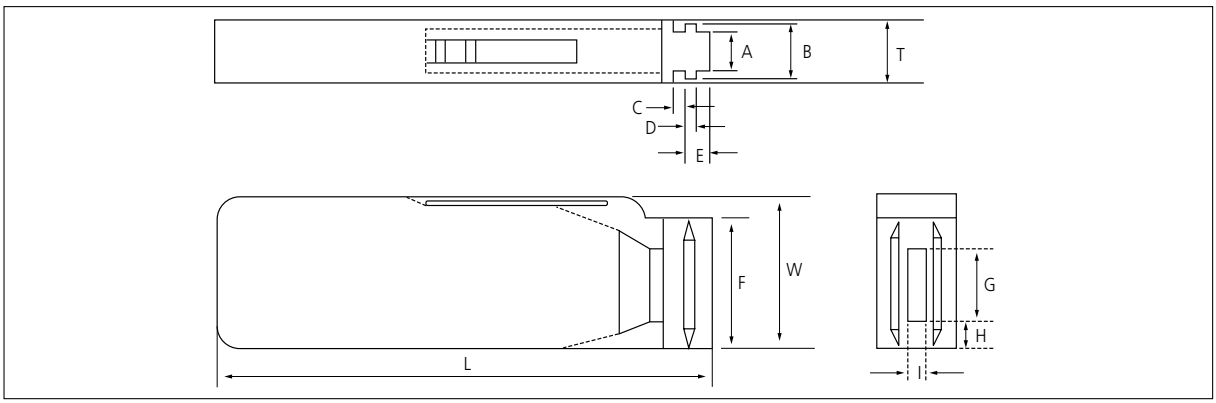
Unit: mm

Symbol	Tape Width	A	B	C	D
7" Reel	8mm	Ø180+0/-3	Ø60+1/-0	Ø13±0.3	4±0.2
	12mm	Ø180+0/-3	Ø60+1/-0	Ø13±0.3	4±0.2
10" Reel	8mm	Ø258+0/-3	Ø80+1/-0	Ø13±0.3	4±0.2
	12mm	Ø258+0/-3	Ø80+1/-0	Ø13±0.3	4±0.2
13" Reel	8mm	Ø330±2.0	Ø80±1.0	Ø13±0.3	4±0.2
	12mm	Ø330±2.0	Ø80±1.0	Ø13±0.3	4±0.2

Symbol	Tape Width	E	W	t
7" Reel	8mm	2.0±0.5	9±0.5	1.2±0.2
	12mm	2.0±0.5	13±0.5	1.2±0.2
10" Reel	8mm	2.0±0.5	9±0.5	1.8±0.2
	12mm	2.0±0.5	13±0.5	1.8±0.2
13" Reel	8mm	2.0±0.5	9±0.5	2.2±0.2
	12mm	2.0±0.5	13±0.5	2.2±0.2

Bulk Case Packaging

- Bulk case packaging can reduce the stock space and transportation costs.
- The bulk feeding system can increase the productivity.
- It can eliminate the components loss.



Unit: mm

Symbol	A	B	T	C	D	E
Dimension	6.8±0.1	8.8±0.1	12±0.1	1.5+0.1/-0	2+0/-0.1	3.0+0.2/-0

Symbol	F	W	G	H	L	I
Dimension	31.5+0.2/-0	36+0/-0.2	19±0.35	7±0.35	110±0.7	5±0.35

• **QUANTITY**

Unit: inch(mm) and pcs

Size	0402(1005)	0603(1608)	0805(2012)	
			T=0.65mm	T=0.85mm
Quantity	50,000	10,000 or 15,000	10,000	5,000 or 10,000